Refer to: Coskey RL, Danzig R: Cardiac arrest due to extreme tachycardia with Wolff-Parkinson-White syndrome. West J Med 120:319-321, Apr 1974

Cardiac Arrest Due to Extreme Tachycardia with Wolff-Parkinson-White Syndrome

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A 17-YEAR-OLD HIGH SCHOOL STUDENT with a five-year history of paroxysmal tachycardia was admitted to hospital on 2 November 1971. Previous episodes had varied in length from 10 to 70 minutes, were precipitated by exertion or excitement and were associated with weakness, soreness of the back and diaphoresis, without polyuria or dyspnea. The patient participated in normal high school physical education. Results of a system review were negative except for symptoms associated with episodes of recurrent tachycardia. The father was said to have hypertension and diabetes mellitus. There was nothing to suggest a family history of Marfan's syndrome. Before admission to hospital the patient had been jogging when he noted sudden onset of tachyarrhythmia. He was immediately brought to the emergency room where functional cardiac arrest occurred, as shown by loss of consciousness and inability to obtain blood pressure during the recording of the electrocardiogram (Figure 1). He responded successfully to immediate direct current (DC) cardioversion.

On physical examination following cardioversion the patient was tall and thin. He appeared to be in no distress. Height was 72½ inches with arm span of 74½ inches. The fingers and toes

Submitted July 19, 1973.

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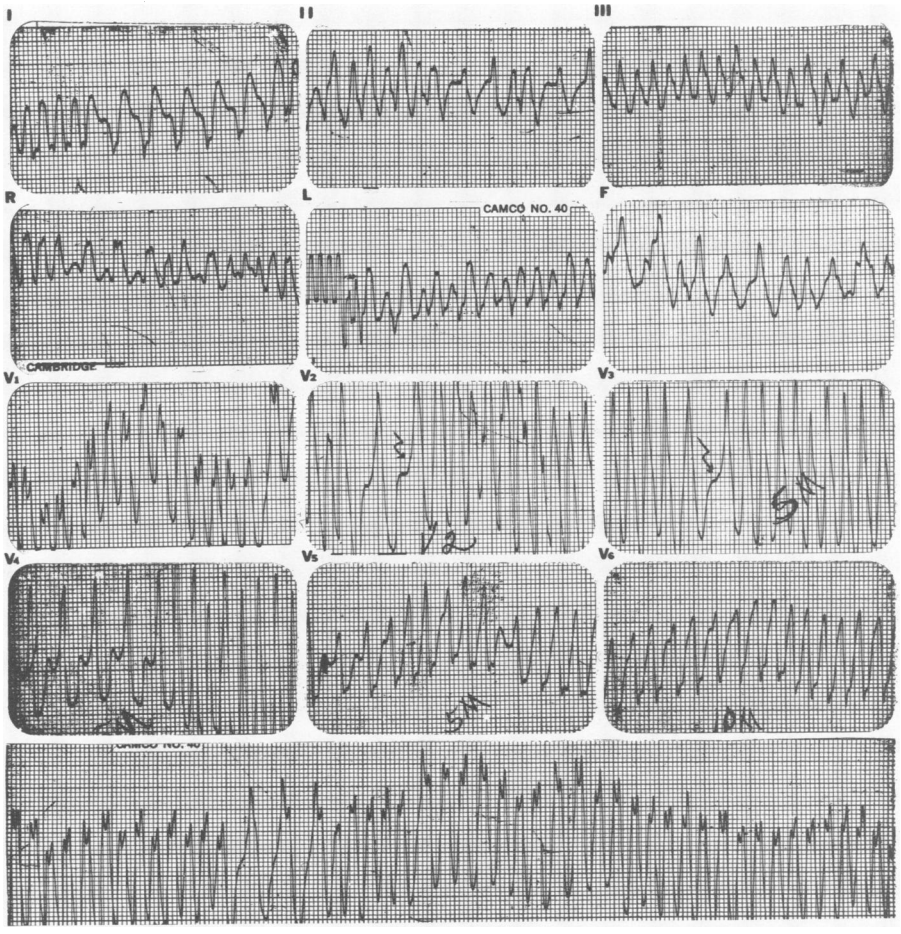

Figure 1.—Electrocardiogram recorded during tachyarrhythmia, showing atrial fibrillation with aberrant ventricular conduction.

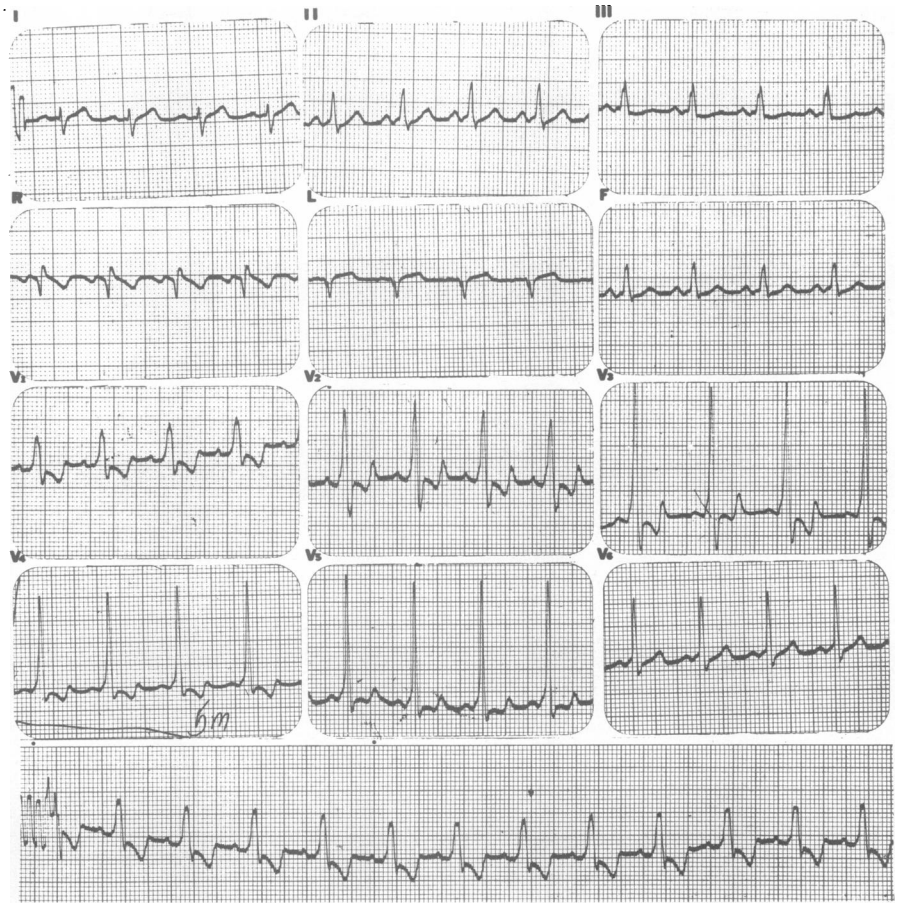

Figure 2.—Electrocardiogram recorded one and a half hours after direct current cardioversion of tachyarrhythmia, revealing type A Wolff-Parkinson-White syndrome with primary ST-T abnormalities.

were long and thin. There were no ocular, cardiac or musculoskeletal abnormalities to suggest Marfan's syndrome or other connective tissue disorder. Cardiac pulsations were normal, as were first and second heart sounds. No murmur or abnormal sounds were noted. Results of chest x-ray studies were within normal limits.

Propranolol was administered in a dosage of 10 mg four times daily and later reduced to 30 mg per day. There were two recurrences of tachyarrhythmia lasting 10 minutes. They were not associated with loss of consciousness and cleared spontaneously. Propranolol was increased to 20 mg four times daily and there were no further recurrences of tachycardia. The electrocardiogram recorded on 2 November during the functional cardiac arrest showed atrial fibrillation with a very rapid slightly irregular ventricular rhythm averaging 338 beats per minute and varying from 215 to 400 beats per minute. The QRS duration was 0.10 seconds. The RR interval was as short as 130 milliseconds (Figure 1). The post-conversion electrocardiogram was consistent with type A Wolff-Parkinson-White (W-P-W) syndrome (Figure 2). Subsequent electrocardiograms demonstrated reversion of the ST-T abnormalities to normal and persistent frontal plane QRS axis of +100° (Figure 3). During the tachyarrhythmia the mean QRS vector was directed to the right, inferiorly and anteriorly with the T wave vector directed to the left, superiorly and posteriorly.

Discussion

The extremely rapid and slightly irregular ventricular response averaging 338 beats per minute and at times approaching 400 beats per minute is even more rapid than the ventricular rate reported with atrial flutter with 1-1 conduction.[1]

The possibility of ventricular tachycardia cannot be completely ruled out, but as has been pointed out by others,[2] the widening of the QRS complexes in tachycardia associated with the W-P-W syndrome usually represents aberrant ventricular conduction simulating ventricular tachycardia. RR intervals averaging 178 milliseconds and as short as 124 milliseconds are significantly less than the average basal atrioventricular (AV) conduction system functional refractory period of

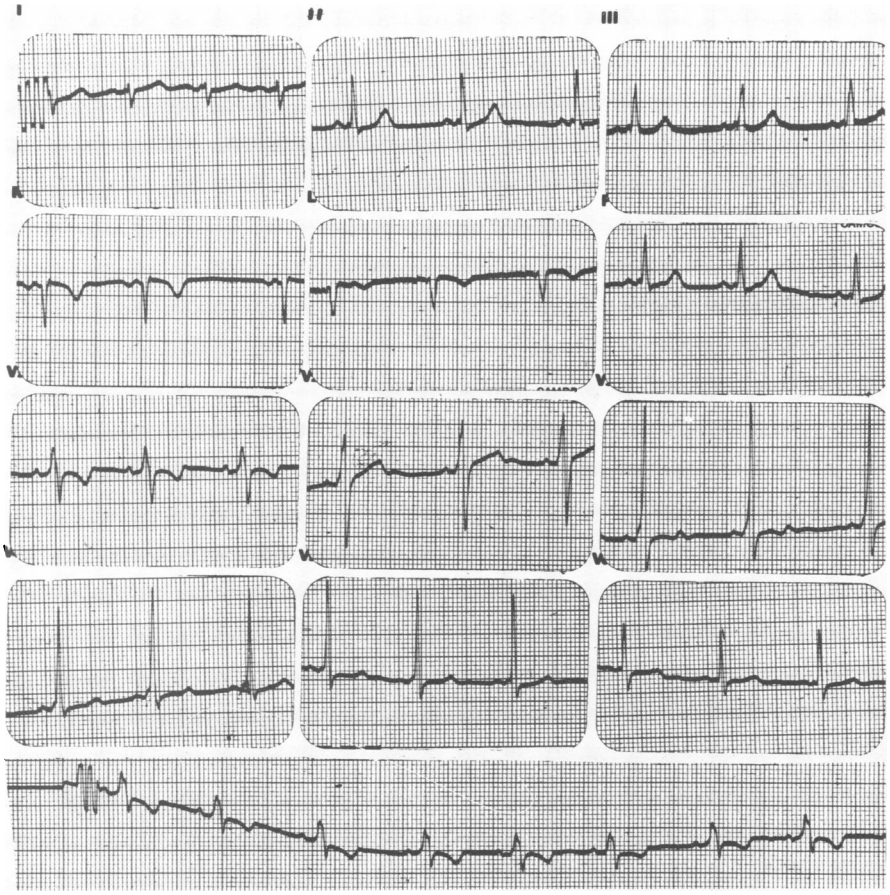

Figure 3.—Electrocardiogram recorded twelve hours after electrical conversion of tachyarrhythmia, revealing a marked decrease in ST-T abnormalities.

350 milliseconds reported in subjects without AV node disease.[3] Pronounced shortening of AV refractory period would be expected in the presence of catecholamine release, however, antegrade bypass fiber conduction is more probable.

The occurrence of functional cardiac arrest in an otherwise apparently healthy male during an extremely rapid supraventricular tachyarrhythmia is of interest. This observation is in contrast to other reports of cardiac arrest due to ventricular fibrillation in patients with W-P-W syndrome.[4-6]

Ventricular fibrillation during atrial fibrillation in W-P-W patients has been postulated to be due to preexcitation of the ventricles per bypass fibers early in the phase of incomplete ventricular recovery. The tracing in the present case, however, demonstrates atrial fibrillation with very rapid ventricular response due to antegrade bypass conduction and hemodynamic failure due to the rapid rate with possible dissociation of electrical and mechanical events.

Summary

A case is presented of functional cardiac arrest due to Type A Wolff-Parkinson-White syndrome with atrial fibrillation and ventricular response averaging 338 beats per minute and approaching 400 beats per minute. The arrest responded promptly to direct current cardioversion and only two further episodes of 10 minutes' duration with spontaneous conversion has been noted since institution of maintenance propranolol therapy.

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